Original Article

Prevalence of specific learning disabilities among Gujarati medium primary school children

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Received - 19 April 2019 Initial Review - 07 May 2019 Accepted - 18 May 2019

ABSTRACT

Introduction: Learning disability in children is an assorted group of disorders where the individual unpredictably fails to proficiently attain, regain, and use information**. Objective:** The objective of this study was to measure the prevalence of specific learning disabilities (SpLDs) such as dyslexia and dysgraphia among the Gujarati medium primary schoolchildren. **Methods:** A cross-sectional study was conducted in public schools of Gujarati medium among children aged 7–12 years from the second, third, and fourth standard. After obtaining a sociodemographic profile, a multilevel screening approach that begins with the identification of educational backwardness followed by exclusion of vision, hearing impairment, chronic health conditions, and subnormal intelligence was carried out among these children. In the last stage, remaining children were subjected to the National Institute of Mental Health and Neurosciences test for SpLDs. **Results:** The prevalence of SpLDs was 9.6% in sampled children, whereas 7.4%, 8.6%, and 7.1% had dyslexia, dysgraphia, and dyscalculia, respectively. Among children diagnosed with SpLD, 65.7% (n=25/38) of children had a combination of all three types of SpLDs. **Conclusions:** This study suggests that the prevalence of SpLDs in public schools is the same as private schools and metro center. We have used a multilevel screening approach that can be utilized for early identification of children with SpLD by Rashtriya Bal Swasthya Karyakram team without imposing load on specialist services. There is a need for sensitization of school teacher for timely referral, remediation strategies, and policy interventions to improve school performance and to reduce dropouts of schoolchildren.

Key words: *Dyscalculia, Dysgraphia, Dyslexia, Scholastic backwardness, Specific learning disabilities*

Learning disability (LD) in children is a well-recognized developmental disorder with profound academic and psychosocial consequences. LDs are a heterogeneous group of disorders where the individual unexpectedly fails to competently acquire, retrieve, and use information. The academic achievement is lower than expected, based on the child's overall intelligence [1-4]. LD has been also defined as a neurodevelopmental disorder of biological origin manifesting itself through learning difficulties and problems in acquiring academic skills, which are markedly below age level. LD manifests during early school years and it is not attributed to intellectual disabilities, or neurological or motor disorders. The difficulties should last for at least 6 months.

The term LD is used synonymously with specific LD (SpLD) and specific learning disorder, the latter used by the fifth edition of Diagnostic and Statistical Manual of Mental Disorders (DSM-5). SpLD is recognized as an important cause for scholastic backwardness [5]. It is unfortunate that children with SpLD felt different from rest, tormented by their peers and suffers neglect from the teachers [6]. These children may also have ineffective information processing abilities, thereby affecting their prioritizing and organizing skills. If left undetected and unattended, many of them may suffer from secondary behavioral problems such as depression, substance abuse, and social delinquency over and above school dropouts. It also causes stress and anxiety in the family [7,8].

Various factors are concerned in understanding of SpLD. Genetic basis and epigenetic factors have been identified, various perinatal risk factors such as low birth weight and prematurity, and social variables such as consanguinity, socioeconomically stress, and maternal education all have been linked with school performance [9-11]. About 5–15% of the school-going children have this disability. The true prevalence of SpLD in India remains disputable among various researchers due to variable diagnostic criteria and tools used [7].

In India, the LD movement has gathered mainstream attention in the past two decades only. During the last decade due to combined efforts from pediatricians, psychiatrist and education department more and more children are being identified with this invisible yet a prominent problem. Still, there is a dearth of epidemiological data and India is a vast country with highly varied sociocultural and educational milieu; therefore, more research is needed to

further improve the understanding of the disorder. This study was undertaken to study the prevalence and sociodemographic profile of SpLD in Gujarati medium primary schoolchildren.

METHODS

Ethical clearance for the study was obtained from the Institute Ethical Committee on human subjects. The list of public primary schools and permission for the study was obtained from the District educational officer and Municipal primary education committee of Jamnagar city. All the schools in the city which followed the Gujarat state syllabus in 2017–2018 were geographically stratified into four sectors. A total of four schools, one from each sector, were included in the study. Selection of school was by lottery method. All the schools were government/corporation run school of Gujarati medium and students from the second, third, and fourth standard were included in the study.

The first visit to each school was planned at the time of the parent-teacher meeting to sensitize them about LD and research work. There were few concerns from teachers about various tests to be performed at school. Concerns were appropriately taken care of. The sociodemographic information about the sampled children was collected initially by the social worker posted in the District Early Intervention Center (DEIC) attached to the pediatric department at Medical College. Team of nursing staff, psychologist, pediatric resident doctor, and pediatrician were involved in the school visits.

Screening of SpLD was in different stages. To begin with, scholastic backwardness was identified which was based on the overall impression of a class teacher on the child's scholastic performance which was verified with result grades/scores of the past two examinations. Grade of C was considered as poor academic performance. All the children with scholastic backwardness were examined to rule out health conditions such as impaired vision (by Snellen's chart provided by Rashtriya Bal Swasthya Karyakram team), impaired hearing by the clinical hearing test as well as needed pure tone audiometry at DEIC, and severe physical conditions by clinical examination that may interfere with their school performance.

Among the children with scholastic backwardness, once the vision, hearing and chronic health conditions were ruled out; they underwent intelligence quotient (IQ) screening by Seguin Form Board (SFB) test to exclude children with subnormal intelligence [12]. SFB test is easy to administer, rapid, reliable, and less time consuming [13]. An IQ of 85 or more measured for chronological age was considered as normal. At the end, all remaining children were subjected to reading, writing, and mathematical performance screening using SpLD battery test developed and validated by the National Institute of Mental Health and Neurosciences (NIMHANS) [14]. Suitable Gujarati words, sentences, and paragraphs were substituted for English version whenever applicable which was pre-decided by the team of developmental pediatrician, special educator, and psychologist of DEIC. This screening test has defined criteria for the identification of subtypes of SpLD.

Total four visits to each school were carried out to cover all the children who may have missed these screening in previous visits. Clinical examination as well as vision and hearing testing were done by the pediatric resident doctor. Pure tone audiometry when needed was performed by audiologist of DEIC. IQ assessment and SpLD test were administered by an experienced clinical psychologist of DEIC. The data analysis was conducted using Epi Info version 7 [15] and SOFA software [16].

RESULTS

A total cross-sectional sample of 393 children was collected from four public schools of Jamnagar city. The sample proportionally represented all four geographical sectors including 94 (24%) children from the west region, 90 (23%) from the south, 83 (21%) from the east region, and with highest (126, 32%) from Jamnagar north region. All the students (100%) were from Gujarati medium public schools. Girls (53.4%) outnumbered boys (47.6%). The mean age of children was 8.13 years. Gujarati was the mother tongue for all the children. Majority of the parents (62%) were uneducated or had primary education. Half of the fathers were unskilled workers like laborers working in private companies, whereas most (83%) of the mothers were housewives. Majority of the families belonged to Class 1 or 2 on the modified BG Prasad classification [17,18]. Ninety-eight (25%) children were born at the first order. Majority of the children were regular in school where only 4% were irregular in attendance.

About 20.6% (n=81) of children were found to be scholastically backward based on the general impression of class teacher and grades of the past two examinations. They underwent various level of screening before a specific test for LD. Of total 393 children, vision problem was identified in 3.05% (n=12), 0.5% (n=2) had hearing impairment. Chronic health conditions such as thalassemia, asthma, attention-deficit/hyperactivity disorder (ADHD), and nephrotic syndrome were present in 2.3% (n=9). Subnormal intelligence (IQ<85) was found in 5.08% (n=20). These children were excluded at a different level of screening. Finally, 38 children were diagnosed as having SpLD.

The overall prevalence of SpLD was 9.66% (n=38). The individual prevalence of 7.4% (n=28/393) was noted for dyslexia, 8.6% (n=33/393) for dysgraphia, and 7.1% (n=27/393) for dyscalculia. Among children diagnosed with SpLD, 65.7% (n=25/38) of children had a combination of all three types of SpLD.

DISCUSSION

The SpLDs are mainly classified into three categories based on a specific aspect of learning components involved. Dyslexia is an LD in reading or comprehension of text caused by deficits in phonologic processing. It is the most common (2–18%), and most studied SpLD and shown to be more common in boys. Dysgraphia is a difficulty in expressive writing (reported prevalence of 14%) in form repeated errors in spelling and grammar, in which children present with difficulties in copying efficiently from the board; may show excessive grammar and punctuation errors; may produce overtly

simple written text and/or produce disorganized text that is difficult to follow. Dyscalculia is a difficulty in mathematical calculations (prevalence–5.5%). Dyscalculia includes problems with number sense, problems retrieving math facts (arithmetic combinations or calculations), difficulty with the language of math (correctly reading and understanding numbers and symbols), word problems in math (correctly reading and understanding the text of word problems), and the visual-spatial and organizational demands of math. Many children would have a combination of above disabilities [1].

The present study demonstrated the prevalence of SpLD of 9.66% which is midway in the generally believed range of 2–18% in India shown in various studies and between 5 and 17% in worldwide [1,7,8,11]. Differences in the prevalence of SpLD across various studies are likely to be due to differences in the type of schools chosen, tools used for screening of LD and age range of children. Majority of Indian studies are either from private schools or from both [7,8]. To the best of our knowledge, this is the probably first kind of study about the prevalence of SpLD from government set up and all the children were from the same medium of instruction. The individual prevalence of 7.4%, 8.6%, and 7.1%, respectively, for dyslexia, dysgraphia, and dyscalculia is again within prevalence range of other studies measuring in the range of 3–18% with dysgraphia being the most common among three. Although the sample size is not large in resent study, it definitely represents all the geographical sectors of the city and all the students were from public schools of a single medium so it might confer some confidence in the outcome.

Sociodemographic profile in the present study was different from other studies published which were mostly from larger and metro cities [6-8,11]. In the present study, majority of the parents were either uneducated or had primary education and fathers were mostly laborers who are different from the study by Manjunatha *et al.* [19] (majority of the fathers were semiprofessional or clerical workers) and by Mogasale *et al.* [7] (majority of the parents were educated high school or above). Like the present study, the majority of other studies did not screen scholastic backwardness due to emotional deprivation and poor motivation which might have misclassified small proportion of children into SpLD. This problem is difficult to address in diverse sociodemographic strata across the country [7].

We found that when compared the total population to the positive cases of SpLD (Table 1), as the age advances more and more students are being identified. This difference is statistically significant at p=0.03. Similar findings were observed by Dhanda and Jagawat [8]. LD being neurodevelopmental disorder most due to cerebral plasticity; SpLD may not be diagnosed conclusively before the age of 8 years [7] and also there exists a referral gap of few years between the onset of symptoms and to seek help as shown by Singh *et al.* [11].

In the present study, boys were more affected with SpLD compared to girls (p<0.001). Majority of the other studies have similar findings with males being affected at least more than 2 times than female. Dhanda and Jagawat [8] as well as Verghese and Govinda [20] concluded that gender of student was not associated with achievements in urban areas, but this finding by them is different from other major studies from India and across the world which clearly shows that boys are affected more commonly than girls in neurodevelopmental disorders such as ADHD, autism, and LD [1,5,7,11].

We did not find a statistically significant difference in the socioeconomic status of parents and prevalence of SpLD as well as birth order or the number of siblings of a child and SpLD. In a study by Dhanda and Jagawat, they found that as there is an increase in the number of siblings, there is decrease number of positive cases. In our opinion, such findings need more study before any generalization [8].

Table 1: Assessment of the positive cases of SpLD through the various characteristics

Characteristics	Total number of sample	Number of positive cases	p value
Age (years)		6	0.03
7	102	15	
8	162	11	
9	109	4	
10	15	1	
11	03	1	
12	02		
Order of birth			
1	98	7	0.328
2 and more	295	31	
Sex			
Male	183	28	<0.001
Female	210	10	
Standard			
2	134	9	0.360
3	145	16	
4	114	13	

SpLDs: Specific learning disabilities

In the present study, multilevel screening approach was used for diagnosis of SpLD. The same approach has also been used in the past [7]. Approach to determine scholastic backwardness with the screening of vision, hearing, chronic conditions, and intellect before actual SpLD assessment reduces time and prevents overburden on expertise. This approach in our opinion can be combined with school health program with RBSK team for early diagnosis of SpLD and its time management such an approach, especially in government, set up schools can help to reduce dropouts due to scholastic backwardness.

Various screening tests are available for diagnosis of SpLD. Some are curriculum based and others are not. Differences in syllabus in state and central boards further aids to the problem of finding the suitable test for LD. We have used an SpLD test developed by NIMHANS as suggested in the consensus statement on LD by Indian Academy of Pediatrics (IAP) [1]. This test does not have all regional language versions available to the best of our knowledge so there is need of standard SpLD test being translated and validated in regional languages. Diagnosis of SpLD is complex. SpLD being a language-based disorder, it is imperative that tests for both receptive and expressive language be included in the comprehensive assessment.

Other procedure includes curriculum-based assessment, dynamic assessment, learning styles assessment, and outcome-based assessment [1] and especially requires sensitization of school teachers to identify children with SpLD early and to refer them for early diagnosis and management. The model used in the present study can be taken up by RBSK team under the school health program. India being a multilinguistic country, there is a need to have more data about the prevalence of SpLD in different regions and need to translate and validate free to use SpLD tools such as NIMHANS battery for its wider applicability. There is a dire need to sensitize school teachers for early suspicion, timely referral for identification, and remediation implementation while supporting the family for this unaddressed problem of the SpLD.

Our study had a major limitation regarding the sample size which was small, so generalization is not possible. Large sample size would have conferred more confidence in the outcome, but the present study is in a single medium and in the same set of board and schools so the outcome of the present study can be very well taken. Inaccurate categorization of small proportion of children into SpLD, particularly in case of those children where parents are laborers, might also coexist in the outcome simply due to the exclusion of screening scholastic backwardness due to emotional hardship and lack of motivation. SpLD might cooccur in such cases, the present study additionally also aims to highlight such vital yet often unaddressed factors.

CONCLUSIONS

We found that nearly 9.6% of primary schoolchildren who were scholastically backward are affected by SpLD in Jamnagar, a city in the western part of Gujarat, India. Among subtypes of SpLD, dysgraphia being the most common and many children had combined SpLD. Boys are more prone to be affected by SpLD as compared to girls. As the age advances more and more children are picked by SpLD. Multistage simplified screening approach used in the present study and one earlier study from Mysore city would have important ramification for the screening of SpLD on a larger scale.

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Funding: None; Conflict of Interest: None Stated.

How to cite this article: Shah CG, Buch PM. Prevalence of specific learning disabilities among Gujarati medium primary school children. Indian J Child Health. 2019; 6(6):283-286.

Doi: 10.32677/IJCH.2019.v06.i06.006